

## Claims

What is claimed is:

- [c1] A plasma generation system, comprising:
  - a plasma generator;
  - a feed system comprising a plurality pneumatic feed devices that supply plasma-forming gas to the plasma generator; and
  - an alternating current power source that powers the plasma generator.
- [c2] The system of claim 1, where the plasma generator further comprises a plurality of electrodes that generate an arc to heat the plasma-forming gas within the interior of the plasma generator.
- [c3] The system of claim 2, where the plurality of pneumatic feed devices comprise a plurality of pneumatic feed rings that are located in the interior of the plasma generator.
- [c4] The system of claim 3, where the plurality of pneumatic feed devices comprise four pneumatic feed rings that are located in the interior of the plasma generator.
- [c5] The system of claim 2, where the feed system supplies the plasma-forming gas at a tangential angle to the interior of the plasma generator.
- [c6] The system of claim 2, where the feed system creates a layer of cooling gas adjacent to the interior of the plasma generator.
- [c7] The system of claim 2, where the alternating current power source comprises a multi-phase transformer that connects each electrode to a conventional alternating current utility network.

- [c8] The system of claim 7, where the number of phases of the transformer is equal to the number of electrodes.
- [c9] The system of claim 7, where the multi-phase transformer is arranged in a wye configuration.
- [c10] The system of claim 7, where the multi-phase transformer is arranged in a wye-double zigzag configuration.
- [c11] The system of claim 7, where the multi-phase transformer is arranged in a wye-polygon configuration.
- [c12] The system of claim 7, where the multi-phase transformer has three phases.
- [c13] The system claim of claim 7, where the multi-phase transformer has six phases.
- [c14] The system of claim 1, where the alternating current power source operates at frequency of 1 – 10 kilohertz.
- [c15] The system of claim 1, where the alternating current power source is connected to the plasma generator through at least one separation filter.
- [c16] A plasma generation system, comprising:
  - means for feeding a gas to a plasma generator with a plurality of pneumatic feed devices;
  - means for heating the gas in the plasma generator to form plasma; and
  - means for directly powering the plasma generator from an alternating current power source.